

quadrangle distinguish it from all of the species with yellow abdomen except *H. kuntzei* Cockerell which has a green, not blue, head and thorax, and has the facial quadrangle as broad below as above and the eyes scarcely if at all emarginate.

*Habitat*.—Eddy, New Mexico. 1 (≡ type) from flowers of *Malvastrum*, April 13 (Cockerell).

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## THE LIFE HISTORIES OF THE NEW YORK SLUG-CATERPILLARS.—XX.

BY HARRISON G. DYAR,

WASHINGTON, D. C.

The series of papers published in the JOURNAL of the New York Entomological Society, under this title, which ceased in 1899, was subsequently continued in 1907 by an account of an additional species, then just worked out. The species which will be now discussed has not been studied from New York material and there are no actual records of the species occurring in the state, yet the probability is that it does so occur, at least occasionally. In 1883 it was taken in Morris Plains, New Jersey, this year having been apparently a specially favorable one for slug-caterpillars, as I remember that *Phobetron pithecium* was remarkably common that year in New York. Again, *Isochaetes beutenmuelleri*, with a typically southern distribution, was taken on Staten Island in 1901 by Mr. Joutel. With these records, therefore, I am inclined to list *Monoleuca semifascia*, here discussed, as one of the New York slug-caterpillars.

I have been attempting to obtain this larva for the past fifteen years. My first trips to Morris Plains, N. J., in 1898 and 1899, were unsuccessful, as were three subsequent ones to Tryon, North Carolina, where Mr. Fiske had taken adults. In these trips it was sought to find larvæ, and the lack of success led me to suspect some unusual habit or food plant. However, such does not seem to be the case. I simply missed finding the larvæ. On the fourth trip to Tryon, N. C., in 1911, with the light tent described by Mr. H. S. Barber (Proc.

Ent. Soc., Wash., XIII, 72, 1911), I took a female adult. This deposited eggs and the larvæ fed normally upon smooth-leaved trees.

I am under obligations to Dr. L. O. Howard for facilitating my last trip to Tyron.

**Monoleuca semifascia** Walker.

1855. *Limacodes semifascia* Walker; Cat. Lep. Brit. Mus., v, 1151.  
 1860. *Monoleuca semifascia* Grote and Robinson; Trans. Am. Ent. Soc., ii, 187, pl. 2, fig. 63.  
 1883. *Monoleuca semifascia* H. Edwards; Papilio, iii, 25.  
 1891. *Monoleuca semifascia* Dyar; Ent. News, ii, 62, pl. 4, fig. 20.  
 1892. *Monoleuca semifascia* Kirby; Cat. Lep. Het., i, 548, 927.  
 1894. *Monoleuca semifascia* Neumoegen and Dyar; Journ. N. Y. Ent. Soc., ii, 69.  
 1898. *Monoleuca semifascia* Dyar; Proc. Ent. Soc. Wash., iv, 302.  
 1899. *Monoleuca semifascia* Dyar; Journ. N. Y. Ent. Soc., vii, 235.  
 1903. *Monoleuca semifascia* Dyar; Bull. 52, U. S. Nat. Mus., 355.  
 1905. *Monoleuca semifascia* Dyar; Proc. U. S. Nat. Mus., xxix, 370.  
 1906. *Monoleuca semifascia* Dyar; Biol. Stud. by pupils of W. T. Sedgwick, 11.

LARVA.

1911. Riley, Proc. Ent. Soc. Wash., xiii, 210.

SPECIAL STRUCTURAL CHARACTERS.

Dorsal and lateral spaces broad, subventral space narrow, contracted; ridges very slight, the lateral the most distinct, approximate to the subventral. Fleshy horn-like processes at first equal, later the terminal ones elongate, the others short; in stage I bearing three setae each, after first molt the subdorsal and lateral rows covered with numerous urticating spines; subventral row rudimentary. The subdorsal horns are long on joints 3 and 13, short and equal on the rest: lateral horn long on joint 3, short on the rest, no lateral horn on joint 5, the spiracle moved up in its place. Depressed areas feebly developed, usually only the glandular centers visible and only those of the centers of the dorsal and lateral spaces visible. Skin at first smooth, finally with rather dense colorless granules. Caltrop patches appear on the lateral horns about stage VII and are well developed in the last stage, when four patches of dense spines appear above the subdorsal horns of joint 13 and lateral of 12 on each side.

The eggs are elliptical, flattened, but of thickness equal to half of the narrow diameter, laid in masses and covered with hair-like filaments from the parent moth.

## AFFINITIES, HABITS, ETC.

The larva belongs to the "tropic spined Eucleids" section 2, type 3 of my synopsis (Journ. N. Y. Ent. Soc., VII, 236), nearly allied to *Adoneta*, *Euclca* and *Sibine*. The spine-patches are present as in these genera, both the caltrops spines of the lateral horns and the terminal patches of *Euclca* and *Sibine*. The coloration is a rather subdued warning color, more conspicuous than in *Euclca* but less so than in *Parasa indetermina*, to which it is more nearly allied in pattern. An unexpected modification is seen in the length of the horns, which are all equal, not irregularly shortened, as in the genera cited. This might appear at first sight a character of generalization, allying the species to lower forms such as *Natada* and *Sisyrosea*, but this relationship is negated by the structures above cited and the equality of the horns is undoubtedly secondarily acquired.

But by far the most remarkable character is that of the eggs. These are typically those of the Megalopygidæ and not those of the family Cochlidiidæ at all. All our other Cochlidiidæ have flat, transparent, wafer-like eggs, similar to but flatter than those of the Tortricidæ. The Megalopygidæ, however, have eggs of appreciable thickness covered with hairs, exactly like those of *Monoleuca*. The Megalopygidæ are evolutionally a much lower group, from which the Cochlidiidæ may be directly derived. The Megalopygid type of egg has been supposedly already replaced by the new type in the original ancestor of the Cochlidiidæ, and its sudden reappearance in one species of Cochlidiidæ high on a specialized branch of the genealogical tree is certainly surprising.

Very little is known about the life history of *Monoleuca semi-fascia*. I have never seen a larva in nature, and the late Dr. Riley, who appears to have been the only person known to have seen one, failed to record the food plant on which it was sent to him.<sup>1</sup> My larvæ fed readily on nearly every leaf offered them and were mostly bred on wild cherry and persimmon. It is presumable that the larvæ are semi-gregarious when young, scattering when older, much as with *Sibine*, and that they will feed on many bushes or low-growing trees with smooth leaves. There is but one brood a year, the adults emerging from overwintering cocoons about the middle of July, the larvæ

<sup>1</sup> Very recently a specimen has been received from Rosharon, Texas, bred from pecan by Mr. G. W. Coles.

growing slowly and maturing in September. The cocoons are probably spun in crevices on the ground, possibly in bark, as they are rather weak in structure and not adapted to be formed among leaves or loose earth.

The distribution of the species appears to be from New York as northern limit southward to the Gulf of Mexico. Recorded localities are New Jersey, West Virginia, North Carolina, Missouri and Texas.

The other three described species of *Monoleuca* are all known only from central Florida.

#### CRITICISM OF PREVIOUS DESCRIPTIONS.

No description of the larva was extant, but recently in looking over the notes at the Bureau of Entomology, Department of Agriculture, I found a description by Dr. Riley, which I had published in the Proceedings of the Washington Society. Dr. Riley's description is excellent for one of its brevity. He did not fail to note the obvious relation of the larva to that of *Euclea delphinii*. The even more obvious relation to *Parasa indetermina* is not mentioned; but I think that larva was unknown to Dr. Riley, at least with its identification complete.

#### DESCRIPTION OF THE SEVERAL STAGES IN DETAIL.

Egg.—Elliptical, gently flattened, uniform, shining pale yellow. Size  $.8 \times .6 \times .3$  mm. Laid in patches of 20 or more, the eggs well spaced, separated from each other by nearly the diameter of an egg and covered loosely with short, stiff, white hairs that do not conceal the eggs but stand up loosely some .5 mm. Surface rather coarsely flatly hexagonally marked, without lines. The hair covering is composed chiefly of short white hairs, pointed at both ends, straight or slightly bent at one end.

Stage I.—Head rounded, pale yellow, with large black coelli and projecting mouth. Thoracic feet small, pointed, normal, pale yellow. Body short, thick, rounded, normal, with two rows of short conical tubercles with three setæ from each. All pale yellow. The larva is more elongate when walking. Sides perpendicular, dorsum broad, slightly depressed centrally. The tubercles form II horns in the upper row, 9 in the lower, each with three rather long, fine, pale hairs with minutely bulbous tips. Later the body is yellow, the horns white,

the subdorsal setæ black. Length, 1.1 mm. Duration of the stage, one day. The larva does not feed.

Stage II.—Elongate, the ends rounded, dorsum flattened, sides oblique, subventral space retracted; subdorsal and lateral ridges rather prominent, the horns subspherical, all alike, bearing many stinging spines; some soft hairs anteriorly and from the lateral warts; pale yellow, the tips of the spines only black. Later a brown infiltration between the horns, especially on the anterior end. This end is a little higher, the body sloping posteriorly. Length .9 to 1.8 mm. The larva often sits with the body curved like *Adoncta*. Duration of the stage 6 days.

Stage III.—Sides parallel, the ends rounded, flattened; dorsal and lateral spaces rather narrow; horns rounded, subspherical, moderately large, those of subdorsal row on joints 3 and 4 a little larger, also the lateral horn on joint 4 slightly enlarged; horns and subventer yellow. The horns with dense short spines, their tips black, especially on the subdorsals. Dorsum and lateral space infiltrated with dark red. The body arches a little behind, flat before. Later the red infiltration concentrates along the subdorsal ridge and on joints 3 and 4, but is still diffuse. Length, 1.7 to 2.5 mm. Duration of the stage 6 days.

Stage IV.—Moderately flattened, sitting curved often; rather long, the posterior end a little depressed, sides parallel; dorsal and lateral spaces subequal, subventral space retracted. Horns subspherical, the subdorsals of joint 3 a little pointed; spines numerous but short and weak. Pale yellow; a narrow dorsal red line and some dull red in a band under the subdorsal ridge; joints 3 and 4 all infiltrated with red dorsally. Dorsal depressed spaces (1) show plainly as pale dots defined by the red color. The red band under the subdorsal ridge really occupies the lateral space nearly entirely and defines the lateral depressed spaces (4), which are pale and cut into the red band. Later the dorsum becomes all gradually infiltrated with reddish. Length, 2.5 to 3.8 mm. Duration of the stage, 6 days.

Stage V.—Rather strongly flattened, but thicker than *Euclea*, the sides parallel except posteriorly, rounded anteriorly; subventral area rather prominently rounded, bulging. Horns short, equal, large, the spines contiguous, but moderate and not darkly colored; subdorsals of joints 3 and 13 a little larger than the others. Dull yellow, the horns

with a trace of vermilion within, under a lens; dorsal space filled with dark red-brown, of which a straight dorsal line is most distinct, the glandular depressed spaces (1) appearing as large pale yellow dots; outline of the dorsal space a wavy line, the expansions between the horns; upper half of lateral space dark red-brown, the edges a little heavier and the centers shining slight pale spaces; region below dull yellow, the row of lateral horns contrasting by its slightly lighter shade. Horns strongly tubercular, the spines numerous, long and black-tipped, but fine and inconspicuous. Later the vermilion in the horns becomes more distinct, but the general effect is dull rusty brown. The dark brown breaks through the subdorsal ridge between the horns of joints 3 and 4 broadly and between 12 and 13 narrowly. A narrow black line appears above the lateral horns. Length, 3.8 to 6 mm. Duration of the stage, 6 days.

Stage VI.—Elongate, the ends rather rounded, dorsal and lateral spaces moderate, subequal, subventer retracted. Horns all subequal, the subdorsals of joints 3 and 13 a little longer, also the lateral of joint 3 longer and conical, the others subspherical. Dorsum purple with elongate white patches on depressed spaces (1), dividing into straight dorsal and wavy subdorsal purple lines; subdorsal ridge pale yellow with central vermilion line, the horns vermilion tinted; horns of joint 3 brownish red. Lateral space with pale patches over depressed spaces (4), pale yellow below, leaving a purple line above which is wavy, and a central one which is straight; a livid purple wavy line on each side of the subdorsal ridge; joints 3 and 4 solidly purple shaded in the interspaces. Impressed glandular dots visible in dorsal space. Skin rather densely granular shagreened. Length, 6 to 8.5 mm. Duration of the stage 6 days.

Stage VII.—Elongate elliptical, dorsum gently arched, moderately broad, sides oblique, subventer retracted. Horns of joint 3 and the subdorsals of 13 slender, conical, rather long and dark vinous, the others rounded, subspherical, vermilion, in a slender vermilion line on the ridge. Surface pale opaque yellowish; dorsal and lateral spaces with three purple brown lines, the center one straight, the side lines wavy; two similar lines in lateral space. Horns well spined (1) and (4) glandular dots darkish. Skin granular shagreened. Clear spaces on the upper sides of all the lateral horns with a few caltropes, the spaces above the subdorsal of 13 and lateral of 12 largest and

without caltropes. Length 8.5 to 13 mm. Duration of the stage 6 days.

Stage VIII.—Elongate elliptical, dorsum gently arched, moderately broad, sides oblique, subventer retracted. Patches of black spines present above the long subdorsal horn of joint 13 and the short lateral one of joint 12; caltrope patches at the bases of the lateral horns on joints 6 to 11. Joint 3 stained with purple, its horns long, tapered and vinous purple. Subdorsal and lateral ridges vermilion lined, the rounded horns short and equal. Dorsum pale pink, the three lines nearly black, the middle one straight, the side lines waved; glandular spots (1) dark with raised granular edges; a yellowish border to the subdorsal ridge. Sides less pinkish, the central line broken and wavy, rather purplish than black, the upper and lower lines black, the upper well waved, the lower less so. Subventer carneous with two blackish lines, the subventral edge reddish. The long subdorsal horn of joint 13 is purplish as also the laterals of 4 and 6 slightly. Skin rather densely clear granular. Spines on the horns white with black tips. Length 13 to 17 mm. Duration of the stage 3 days (in hot weather).

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## THE EGGS AND NYMPHAL STAGES OF THE DUSKY LEAF BUG CALOCORIS RAPIDUS SAY.

BY R. L. WEBSTER AND DAYTON STONER.

AMES, IOWA.

In the course of some work on potato insects, being carried on at the Iowa Experiment Station, a few notes were accumulated on the dusky leaf bug, *Calocoris rapidus* Say, which occurred rather abundantly on potato plants at Ames in 1913. The egg, which had not been previously observed, was found, and descriptions of the five nymphal stages were prepared. These notes are from the files of the entomological section of the Iowa Agricultural Experiment Station at Ames.